Phenanthrene

Chemical Information
CAS Number - 85-01-8
Alternate Names - PhenAnthracene
General Uses - This chemical is used to make dyes, plastics, pesticides, explosives and drugs. It has also been used to make bile acids, cholesterol and steroids.
Potential Hazards - This chemical may cause irritation to the skin and respiratory tract. It emits acrid smoke and fumes when heated to decomposition.

Summary Analysis– Phenanthrene

- In 2003, the 1,817,292 pounds of phenanthrene represented 2.3 percent of the total quantity of PCs. In 2003, there was more than a 275 percent increase in the total quantity of phenanthrene, compared to the quantity reported in 1999.
- Since 1999, there was about a 37 percent increase in the number of facilities reporting this chemical, with 52 facilities reporting a PC quantity of phenanthrene in 2003. Three facilities reported almost 92 percent of the total quantity of this chemical
- In 1999-2003, there was no apparent trend in how phenanthrene was managed. In 2003, treatment was used for almost 55 percent of the total quantity of phenanthrene; energy recovery for about 41 percent, and disposal for 4 percent. Since 1999, recycling of phenanthrene increased by over 100 percent..
- In 2003, almost 96 percent of the phenanthrene was reported by facilities in Regions 4, 5 and 6. The quantity of phenanthrene reported in Regions 4 and 6 increased significantly, compared to the quantities reported in 1999. In 2003, however, there was a 60 percent decrease in the quantity reported by Region 6 facilities, compared to the quantity reported in 2002. The quantity reported by facilities in Region 4 increased dramatically in 2003 – by over 741,000 pounds. Most of this increase was reported by a facility in Kentucky that had not reported this chemical in previous years.
- Facilities in 3 states (Texas, Kentucky, Indiana) accounted for almost 94 percent of the total quantity of phenanthrene in 2003. Compared to the quantities reported in 1999, facilities in all 3 of these states reported a significant increase. .
- Facilities in 6 industry sectors reported over 99 percent of the total quantity of phenanthrene in 2003. In 2003, facilities in SIC 3334 (Primary Aluminum) reported 41 percent of the total quantity of phenanthrene. A SIC 3334 facility, located in Kentucky, reported most of this quantity. In SIC 2819 (Industrial inorganic chemicals, nec), 1 facility, located in Texas, reported about 40 percent of the total quantity of phenanthrene.

National Trends – Phenanthrene. Exhibit 4.204 presents the total PC quantity (pounds) of phenanthrene reported in 1999 to 2003, showing the disposal, treatment, energy recovery, as well as recycling quantities. In 2003, the 1,817,292 pounds of phenanthrene represented 2.3 percent of the total quantity of PCs. In 2003, there was more than a 275 percent increase in the total quantity of phenanthrene, compared to the quantity reported in 1999. However, compared to the quantity in 2002, there also was a 21 percent increase. Since 1999, there was about a 37 percent increase in the number of facilities reporting this chemical, with 52 facilities reporting a PC quantity of phenanthrene in 2003.

In 1999-2003, there was no apparent trend in how phenanthrene was managed. In 2002, the large increase in reported quantity of phenanthrene also translated into a large increase in the use of energy recovery. However, in 2003, there was a subsequent 21 percent decrease in the quantity that was managed via energy recovery. Although the total quantity of phenanthrene decreased in 2003, compared to 2002, the treatment quantity increased significantly – by almost 925,000 pounds.

In 2003, almost 55 percent of the total quantity of phenanthrene was treated; 41 percent was sent to energy recovery. Since 1999, recycling of phenanthrene increased by over 100 percent with 769,067 pounds of phenanthrene recycled in 2003.

Exhibit 4. 204. National-Level Information for Phenanthrene (1999-2003)

	1999	2000	2001	2002	2003	Percent Change (1999-2003)	Management Method -- Percent of Quantity of this Chemical in 2003
Number of Facilities	38	44	50	49	52	36.8%	
Disposal Quantity (lbs.)	116,214	20,094	74,673	42,529	72,752	-37.4%	4.0%
Energy Recovery Quantity (lbs.)	216,450	178,413	98,290	2,196,198	749,069	246.1%	41.2%
Treatment Quantity (lbs.)	151,305	818,821	63,249	70,548	995,471	557.9%	54.8%
Priority Chemical Quantity (lbs.)	483,969	1,017,328	236,212	2,309,275	1,817,292	275.5%	
Recycling Quantity (lbs.)	371,747	423,479	460,005	982,860	769,067	106.9%	

Exhibit 4.205 shows the number of facilities that reported phenanthrene within various quantity ranges. Of the 52 facilities that reported phenanthrene in 2003, 3 facilities reported almost 92 percent of the total quantity of this chemical. Two of these 3 facilities accounted for about 81 percent of the total quantity.

Exhibit 4. 205. Distribution of Facilities that Reported Quantities for Phenanthrene (2003)

Phenanthrene (1,817,292 pounds)		
Quantity Reported	**Number of Facilities Reporting this quantity**	**Percent of Total Quantity for this Priority Chemical**
up to 10 pounds	7	less than 0.1%
between 11 - 100 pounds	8	less than 0.1%
between 101 -1,000 pounds	14	0.5%
between 1,001 - 10,000 pounds	17	3.6%
between 10,001 - 100,000 pounds	3	4.1%
between 100,001 - 1 million pounds	3	91.8%
> 1 million pounds	0	0.0%
> 1 million pounds	0	0.0%

EPA Region Trends- Phenanthrene. Exhibit 4.206 shows the quantity (pounds) of phenanthrene reported by facilities in 9 EPA Regions in 1999 to 2003. In 2003, almost 96 percent of the phenanthrene was reported by facilities in Regions 4, 5 and 6. The quantity of phenanthrene reported in Regions 4 and 6 increased significantly, compared to the quantities reported in 1999. In 2003, however, there was a 60 percent decrease in the quantity reported by Region 6 facilities, compared to the quantity reported in 2002. The quantity reported by facilities in Region 4 increased dramatically in 2003 – by over 741,000 pounds. Most of this increase was reported by a facility in Kentucky that had not reported this chemical in previous years. The quantity reported by Region 5 facilities decreased by over 18 percent. Quantities of phenanthrene reported in 4 other states also decreased in 2003.

Exhibit 4. 206. Quantity of Phenanthrene Reported by EPA Regions (1999-2003)

EPA REGION	1999	2000	2001	2002	2003	Percent Change in Quantity (1999-2003)	Percent Of the Total Priority Chemical quantity (2003)
6	172,760	798,299	119,911	1,900,205	768,548	344.9%	42.29%
4	1,992	6,140	1,850	3,982	745,198	37309.5%	41.01%
5	280,397	188,581	77,451	372,997	228,456	-18.5%	12.57%
3	15,711	9,793	31,682	25,603	64,569	311.0%	3.55%
9	13	47	1,133	1,244	5,213	40000.0%	0.29%
8	8,380	9,186	1,302	2,772	3,269	-61.0%	0.18%
10	2,184	2,142	1,273	1,091	1,246	-42.9%	0.07%
7	1,912	3,140	1,610	1,380	793	-58.5%	0.04%
1	620	0	0	0	0	-100.0%	0.00%

Exhibit 4. 207. Distribution of Facilities Reporting Phenanthrene in 2003 & Quantity of Phenanthrene Reported in 2003 by Region

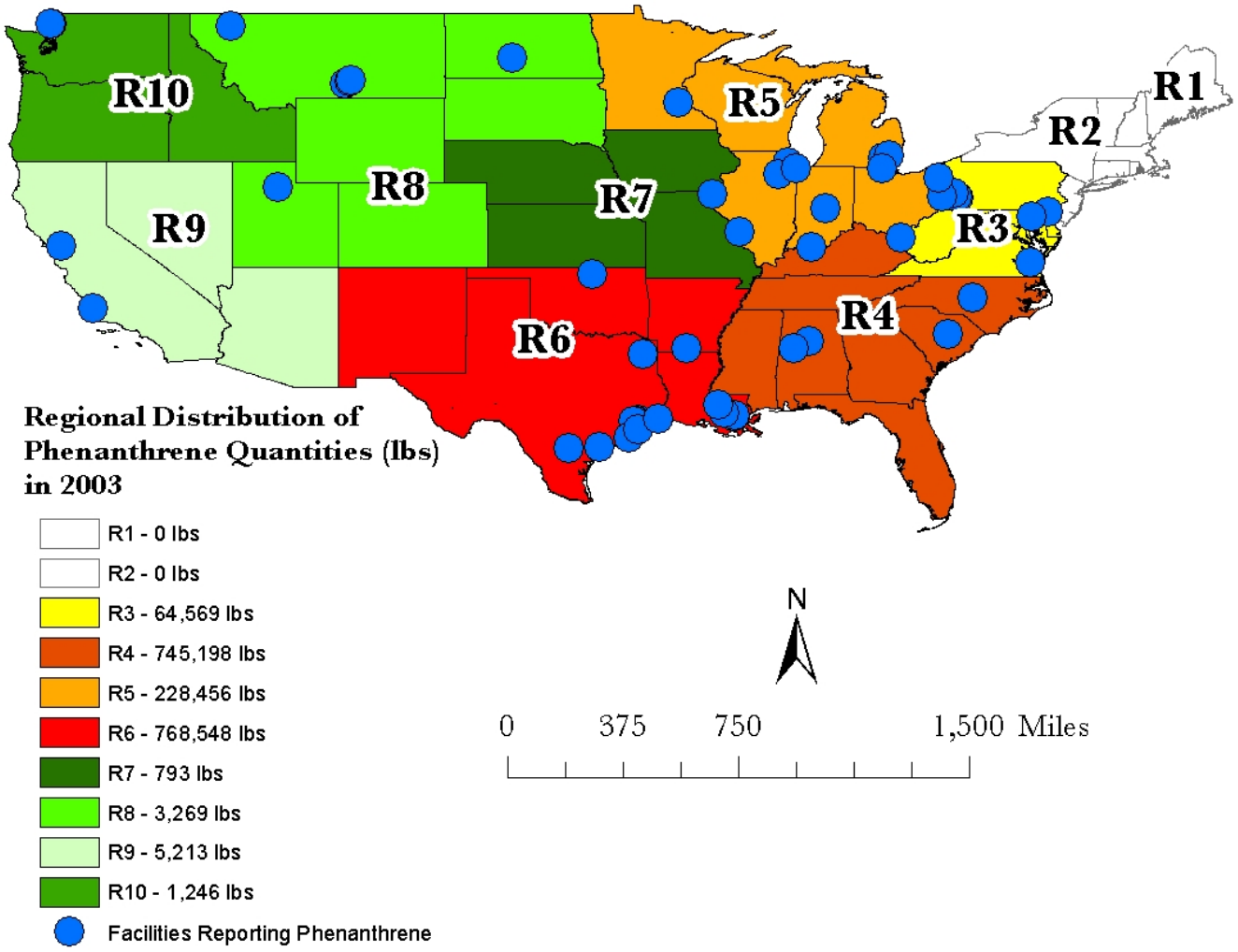

Exhibit 4.208 shows how phenanthrene was managed by facilities in the 8 Regions that reported this chemical in 2003. Region 6 facilities used energy recovery, primarily onsite, for their phenanthrene. Facilities in Regions 4, 5, 9, and 10 primarily used onsite treatment for most of their phenanthrene. Facilities in Regions 3 and 7 primarily used offsite disposal, although Region 3 facilities also used treatment for about 30 percent of their phenanthrene. In 2003, facilities in numerous EPA Regions reported significant recycling phenanthrene.

Exhibit 4. 208. Management Methods for Phenanthrene, By EPA Region (2003)

EPA Region	Disposal		Energy Recovery		Treatment		Recycling	
	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
6	983	1,243	728,631	16,245	8,466	12,980	0	616,983
4	0	5,811	0	3,050	735,986	351	23,794	0
5	2,396	14,717	0	85	210,503	755	69,995	2
3	0	45,036	0	901	4,634	13,998	25,463	29,000
9	0	135	0	0	4,970	108	0	10
8	1,637	1	0	98	1,531	2	1,017	4
10	0	0	59	0	1,031	156	2,799	0
7	0	793	0	0	0	0	0	0

State Trends- Phenanthrene. In 1999-2003, facilities in 26 states reported a PC quantity of phenanthrene. Exhibits 4.209 and 4.210 show the quantities of phenanthrene reported in 3 states (Texas, Kentucky, Indiana) where facilities accounted for almost 94 percent of the total quantity of this chemical in 2003. Compared to the quantities reported in 1999, facilities in all 3 of these states reported a significant increase. Facilities in both Texas and Kentucky reported about 41 percent of the total quantity. In 2003, the quantity reported by Texas facilities decreased almost 60 percent, compared to the previous year. The large increase in Kentucky resulted primarily from 1 facility that had not reported in previous years. Likewise, 1 facility accounted for the large increase in Indiana.

Exhibit 4. 209. State-Level Information for Phenanthrene (1999-2003)

State	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
Texas	167,218	792,923	99,828	1,884,994	757,623	590,405	353.1%	41.7%
Kentucky	0	0	0	1,500	740,470	740,470	NA	40.7%
Indiana	19,612	17,064	5,395	27	200,451	180,839	922.1%	11.0%

Exhibit 4. 210. Trends Analysis of States Representing 94 Percent of the Total Quantity of Phenanthrene (2003)

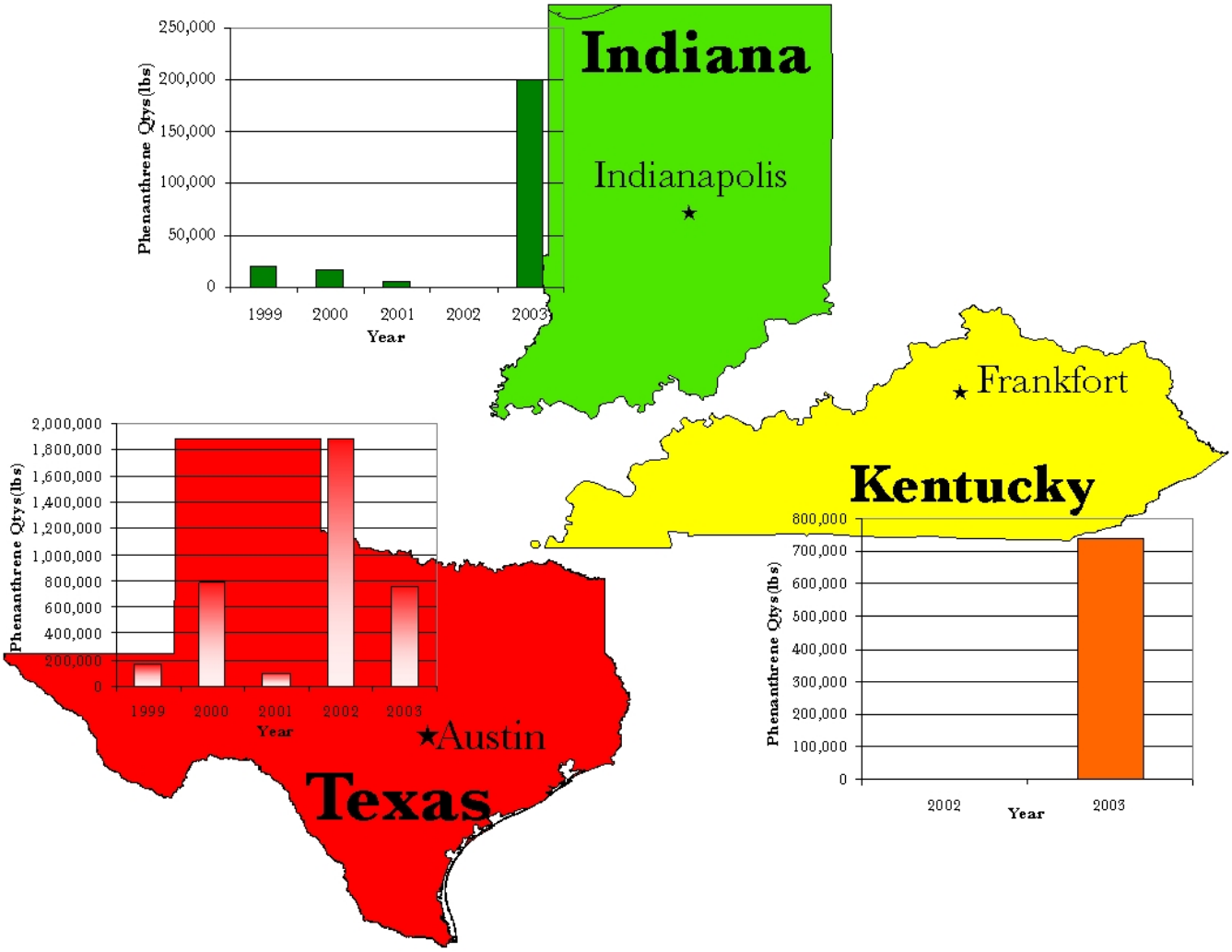

Exhibit 4.211 shows how phenanthrene was managed by 16 facilities in the 3 states that reported almost 94 percent of the total PC quantity of this chemical in 2003. In each of the 3 states, 1 facility dominated how the phenanthrene was managed in the state. Over 96 percent of the phenanthrene reported by Texas facilities was managed via onsite energy recovery – by 1 facility. Similarly, over 99 percent of the phenanthrene reported by 2 Kentucky facilities was treated onsite – by 1 facility. Over 99 percent of the phenanthrene reported by 2 Indiana facilities was treated onsite – by 1 facility. Facilities in both Texas and Indiana reported significant recycling of phenanthrene in 2003.

Exhibit 4. 211. Management of Phenanthrene in States (2003)

State	Total Priority Chemical Quantity (2003)	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
Texas	757,623	973	231	728,631	15,470	527	11,791	0	616,983
Kentucky	740,470	0	3,984	0	250	735,986	250	0	0
Indiana	200,451	0	6	0	0	200,017	428	67,552	0

Industry Sector (SIC) Trends- Phenanthrene. In 1999-2003, facilities in 17 industry sectors (SIC codes) reported a PC quantity of phenanthrene. Exhibit 4.212 shows the quantities of phenanthrene reported by 6 industry sectors where facilities accounted for over 99 percent of the total quantity of this chemical in 2003. In 2003, facilities in SIC 3334 (Primary Aluminum) reported 41 percent of the total quantity of phenanthrene. One facility, located in Kentucky, reported most of this quantity. In SIC 2819 (Industrial inorganic chemicals, nec), 1 facility, located in Texas, reported about 40 percent of the total quantity of phenanthrene, representing a large increase for this industry sector, compared to previous years. However, this large increase that occurred in 2003 for the SIC 2819 is misleading. For the 2003 reporting year, this facility changed the primary SIC code from 2812 to 2819. The large increase reported in 2003 by SIC 2911 (Petroleum refining) facilities was primarily attributed to 1 facility in Indiana.

Facilities in SIC 2865 (Cyclic crudes and intermediates) and SIC 2869 (Industrial organic chemicals, nec) reported significant decreases of phenanthrene, -81.2 percent and – 71.0 percent, respectively.

Exhibit 4. 212. Industry Sector-Level Information for Phenanthrene (1999-2003)

Primary SIC Code	SIC Description	Number of Facilities for this SIC Code (2003)	1999	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
3334	Primary aluminum	2	4,084	2,142	250	1,179	741,470	737,386	18055.5%	40.8%
2819	Industrial inorganic chemicals, nec	1	0	48,330	18,968	0	728,646	728,646	NA	40.1%
2911	Petroleum refining	24	80,645	28,725	8,701	16,516	221,246	140,601	174.3%	12.2%
2865	Cyclic crudes and intermediates	5	272,816	181,781	97,255	387,495	51,255	-221,561	-81.2%	2.8%
2869	Industrial organic chemicals, nec	7	117,000	747,185	83,624	66,903	33,886	-83,114	-71.0%	1.9%
3312	Blast furnaces and steel mills	4	4,447	3,452	3,165	2,023	29,682	25,235	567.5%	1.6%

Exhibit 4.213 shows how phenanthrene was managed by facilities in the 6 industry sectors that reported over 99 percent of this PC in 2003. Onsite treatment was the primary method used by facilities in SIC 3334 (Primary Aluminum) and SIC 2911 (Petroleum refining). For each of these industry sectors, 1 facility accounted for most of the treated quantity of phenanthrene. The facility in SIC 2819 (Industrial inorganic chemicals, nec) managed almost 100 percent of the phenanthrene via onsite energy recovery. About 71 percent of the phenanthrene reported by facilities in SIC 3312 (Blast Furnaces and steel mills) was sent to offsite disposal; offsite

treatment was used for the remaining quantity. Facilities in SIC 2869 (Industrial organic chemicals, nec) treated about 50 percent of their phenanthrene; about 46 percent was managed via offsite energy recovery and the remaining 4 percent was land disposed. The 1 facility in SIC 2865 (Cyclic crudes and intermediates) sent about 68 percent of the phenanthrene to offsite disposal; 25 percent to treatment and the remainder to offsite energy recovery. Some recycling of phenanthrene was reported by facilities in 5 of the 6 industry sectors. One facility in SIC 2869 accounted for 97 percent of the recycling reported for this industry sector.

Exhibit 4. 213. Management of Phenanthrene in Industry Sectors (SIC Codes) (2003)

SIC Code	SIC Description	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
3334	Primary aluminum	1,500	3,984	0	0	735,986	0	837	0
2819	Industrial inorganic chemicals, nec	0	0	728,631	0	14	1	0	0
2911	Petroleum refining	241	900	59	1,124	218,015	907	4,320	461
2865	Cyclic crudes and intermediates	0	34,932	0	3,700	7,748	4,875	1,205	0
2869	Industrial organic chemicals, nec	879	643	0	15,470	4,304	12,590	0	616,538
3312	Blast furnaces and steel mills	0	21,077	0	0	0	8,605	25,360	29,000

Recycling. Exhibit 4.214 provides some indication of the extent to which facilities in certain industry sectors recycled at least 100 pounds of phenanthrene in 1999-2003, rather than manage it as a waste. For those year(s), the facility did not report a PC quantity, i.e., a quantity managed via land disposal, energy recovery, or treatment.

Exhibit 4. 214. Facilities reporting Recycling but not a Priority Chemical quantity (1999-2003)

			1999		2000		2001		2002		2003	
Number of Facilities	EPA Region	State	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle	Onsite Recycle	Offsite Recycle
SIC 2491 -- Wood preserving												
1	1	Connecticut	0	0	4,022	0	3,800	0	6,973	0	6,764	0
SIC 2865 -- Cyclic crudes and intermediates												
1	4	Alabama	0	0	0	0	0	0	580	0	580	0
SIC 2869 -- Industrial organic chemicals, nec												
1	6	Texas	0	0	0	490,000	0	600,000	0	0	0	0
SIC 3312 -- Blast Furnaces and steel mills												
1	2	New York	7,500	0	8,610	0	9,196	0	8,786	0	8,493	0
3	3	Pennsylvania	152,000	0	401,953	0	480,283	0	53,000	25,109	45,000	0
2	4	Alabama	1,976	0	25,542	0	2,979	0	25,255	0	45,512	0
SIC 3334 --Primary aluminum												